WAR DEPARTMENT
Bureau of Public Relations
PRESS BRANCH
Tel. - RE 6700
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August 8, 1945

MEMORANDUM FOR THE PRESS:

In response to inquiries from the press regarding news stories appearing in this morning's newspapers based on an interview with Dr. Harold Jacobson, the War Department today issued the following statement:

"In the opinion of the most competent experts who have been studying all phases of the effects of the bomb for a number of years there is no basis for Dr. Jacobson's speculations with respect to radioactivity. There has been no expectation by these same experts of any such radioactive phenomena as he decribes."

Dr. J. R. Oppenheimer, the head of this phase of the work, when asked for his views said, "Based on all of our experimental work and study, and on the results of the test in New Mexico, there is every reason to believe that there was no appreciable radioactivity on the ground at Hiroshima and what little there was decayed very rapidly."

END

JOINT ARMY-NAVY TASK FORCE NUMBER ONE

OPERATION CROSSROADS -- RELEASE NO. 46

FOR RELEASE WITH PICTURES
TO PRESS AND RADIO AT
VICE ADMIRAL BLANDY'S PRESS CONFERENCE
2:30 P.M. (E.S.T.), MAY 13, 1946

FULL STORY OF ATOMIC BOMB TESTS WILL BE TOLD TO PUBLIC

. . . . . .

Vice Admiral W. H. P. Blandy, U.S.N., Commander Joint Army-Navy Task Force One, announced today that observers and representatives of the press would be able to view the general arrangement of the target vessels and other military equipment in Bikini Atoll. While technical details will not be disclosed, the press will see the target array, both before and after the tests, and both from the surface and from the air.

This is but one step being taken to insure that the public has fullest confidence that the experiments are being conducted purely as fact-finding scientific tests for future guidance with no intent to "prove" or "disprove" any present-day theories concerning military, air and naval strategy and tactics. All possible facts consistent with National security will be released so that the public will not await the results with the misconception that these tests alone will once and forever establish whether there will be a great or small air force, navy or ground force.

Early in the planning stages of the tests it was clearly recognized that no one test or series of tests could at the same time:

(a) Simulate war conditions,

(b) Provide the data which are desired from the purely scientific point of view, and

(c) Provide the data which are essential if military and naval strategists, engineers, designers and medical officers are to have the information they need in order to proceed along sound and economical lines in developing our Armed Forces.

The basic directives require that the tests provide the essential data required by the Armed Forces. The tests are primarily planned, therefore, to determine and to measure with precision what happens at various distances whan an atomic bomb is used against ships and other items of military equipment such as tanks, airplanes, radio sets, etc. Much information of value to pure science will also be obtained, and, where practicable, duplication or simulation is made of typical operating conditions.

The arrangement of the ships in the target array for the first test was reached after the many factors affecting the problem were carefully analyzed by the Army and Navy and by civilian scientists. The array agreed upon is considered the best which will obtain the maximum of valuable information.

It is so arranged that (a) maximum damage will be inflicted on the cluster of ships at the point of aim by one airplane dropping one bomb, and (b) a progressive decrease in damage will be inflicted on ships at increasing distances from the explosion to a point where it is intended that almost negligible damage will be encountered by ships farthest from the aiming point.

Some of the ships and target material, at considerable distances from the point of aim in the first test, can probably be placed in satisfactory condition to be close to the point of detonation in the second test. This aspect was considered in the arrangement of the target array.

Some of the smaller ships have little significance from the point of view of measuring effects of blast on the ships themselves but are stationed at measured distances in order to form platforms on which recording instruments and cameras may be installed.

Typical conditions will be approximated by loading the ships with varying degrees of combat supplies such as fuel oil, gasoline, bombs, ammunition, torpedoes, etc. The ship loadings will vary from some almost full to some almost empty, which is the normal situation with ships at sea and at anchor both in war and peace.

However, there is no thought of simulating an "attack" by atom-bomb-loaded airplanes against a disposition of ships at sea or at anchor in a harbor. This should be very clear from the diagram of the approximate target array to be used in the first test which is furnished herewith. This diagram shows relative locations of ships, and closely approximates the expected exact location of each ship. It should be remembered, however, that the final locations of the ships at the time of the tests will depend on such factors as the direction of the wind and the length of anchor chain, as ships riding to a single anchor will swing to the wind in a circle a quarter mile or more in diameter.

Also furnished is a diagram showing a portion of a carrier task force at sea and a typical anchorage plan, drawn to exactly the same scale and compared to the target array diagram for the Bikini Atoll test.

Simulation of actual bombing attack conditions is also precluded by the fact that only one bomb is used and by several other factors. More than a score of ships are concentrated within a circle of 1,000 yards radius at the center of the Bikini array for two principal reasons: First, to insure doing major damage to a capital ship even if the bomb does not detonate exactly over the bullseye, and, second, to provide a positively identifiable point of aim to the bombardier from a high bombing altitude. Other steps being taken to place the bomb over the aiming point with the extreme accuracy required in this test and not normally available or essential under war conditions include: Painting the battleship NEVADA at the center a bright red-orange, installing a radar beacon on the NEVADA, providing special destroyer station ships as navigation checks for the bomber's approach, and using precise radar methods for obtaining accurate wind data at all altitudes over the target.

The bomb which will be used in both of the tests in 1946 is the "standard" type. This is the type which was used at Nagasaki. It is the best type which we have available and that is the reason it is being used. There is no desire on the part of the Joint Chiefs of Staff or the personnel conducting the CROSSROADS Operation to "hold back" a more powerful bomb. If a more powerful bomb were now available, it would be employed.

For reasons of security, the President has decreed that all information connected with the development, manufacture, operational techniques and characteristics of the atomic bomb be kept a secret of the United States. For related security reasons the information outlined below cannot be made public:

(a) The exact point of detonation of the bomb with respect to the point of aim of the target array.

(b) The altitude at which the bomb is detonated.

(c) The exact bearings and distances at which the ships are stationed with respect to each other.

(d) The special equipment and techniques used by the airplane involved in dropping this bomb.

(e) The exact pressures, temperatures and other data obtained at various distances from the point of burst.

(f) The degree of efficiency of the explosion.

(It is conceivable that the bomb might be almost a "dud" or have a very "efficient" high-order detonation. With our present limited knowledge of atomic fission, there is a range of possibilities between these two extremes which cannot be accurately foretold or measured. Whether or not determined, no official announcement is contemplated as to the factor of efficiency of explosion obtained.)

(g) Large numbers of detailed photographs showing bomb damage.

(Photographs produce exact and measurable records; analysis of large numbers of related photographs of bomb damage can evolve much precise information. While the press representatives who write for publication and broadcast by radio will be permitted to do so without censorship of their copy, the national security requires that all photographs be reviewed for security and that the information obtainable from photographs of damage be limited. Representative pictures showing damage will be released as soon as practicable after the tests, some by radio photo from Bikini. These pictures will be selected to provide the public with a true graphic record of the general effects of the test. Only such identification of ships and viewpoints in the photographs will be released as will not prejudice the security interests of our country.)

The evaluation of the information obtained from the Bikini tests will take many months. Intelligent progress toward world peace as an enduring condition on our planet may be jeopardized if the public of the world at large, as a result of the headlines made by the tests, jumps to hasty and possibly erroneous conclusions as to the effects of atomic attacks against ships and military material. No sound conclusions can be reached prior to a studied evaluation of the results of the tests by the Joint Chiefs of Staff. To assist them in this evaluation the Joint Chiefs of Staff have appointed a Board of civilian, military, and naval experts who have also been available to Commander Joint Army-Navy Task Force One for advice during the major part of the planning and execution of Operation CROSSROADS.

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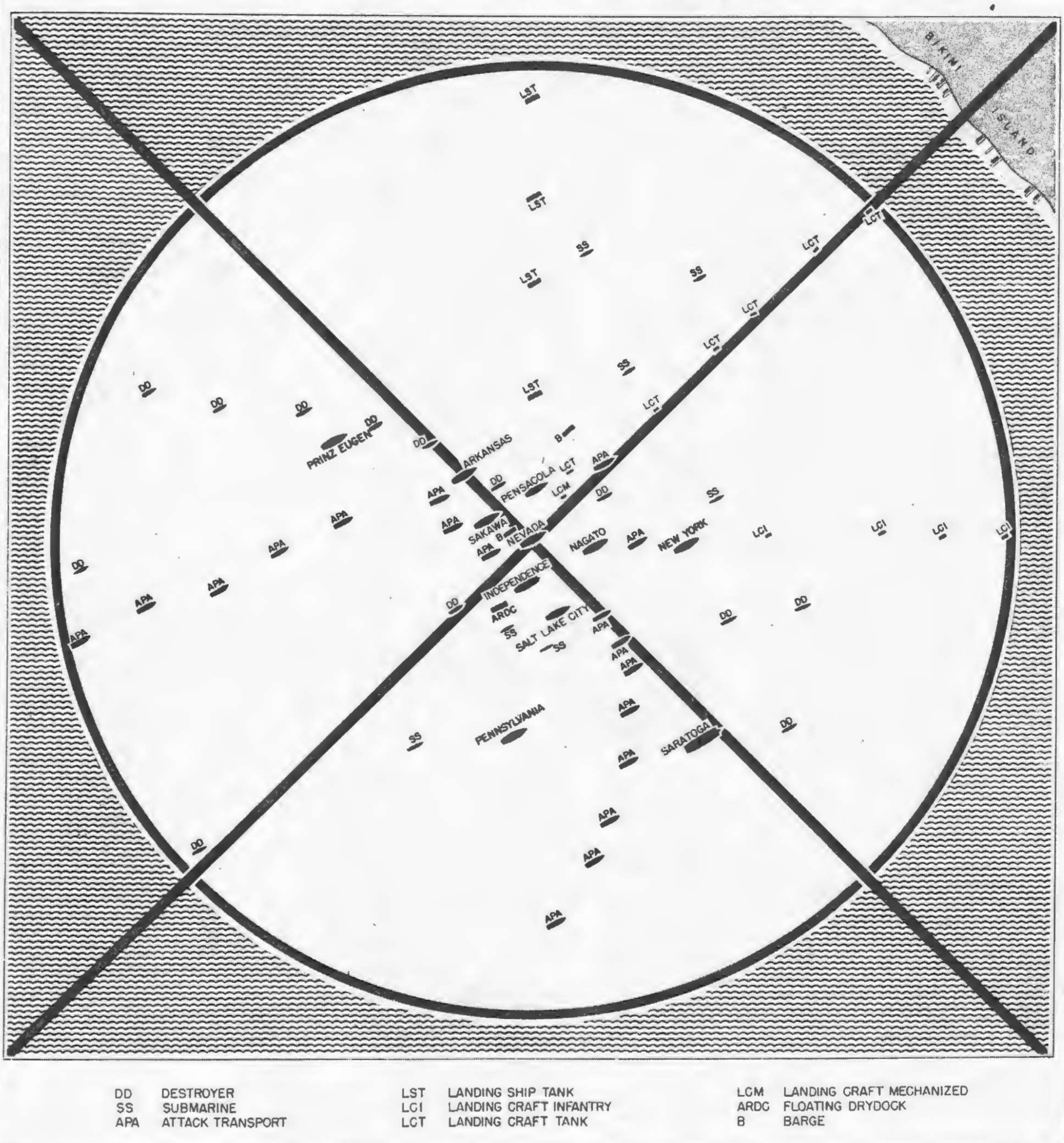
"OPERATION CROSSROADS"

FIRST ATOMIC BOMB TEST

APPROXIMATE DISPOSITION OF SHIPS IN TARGET ARRAY AT BIKINI



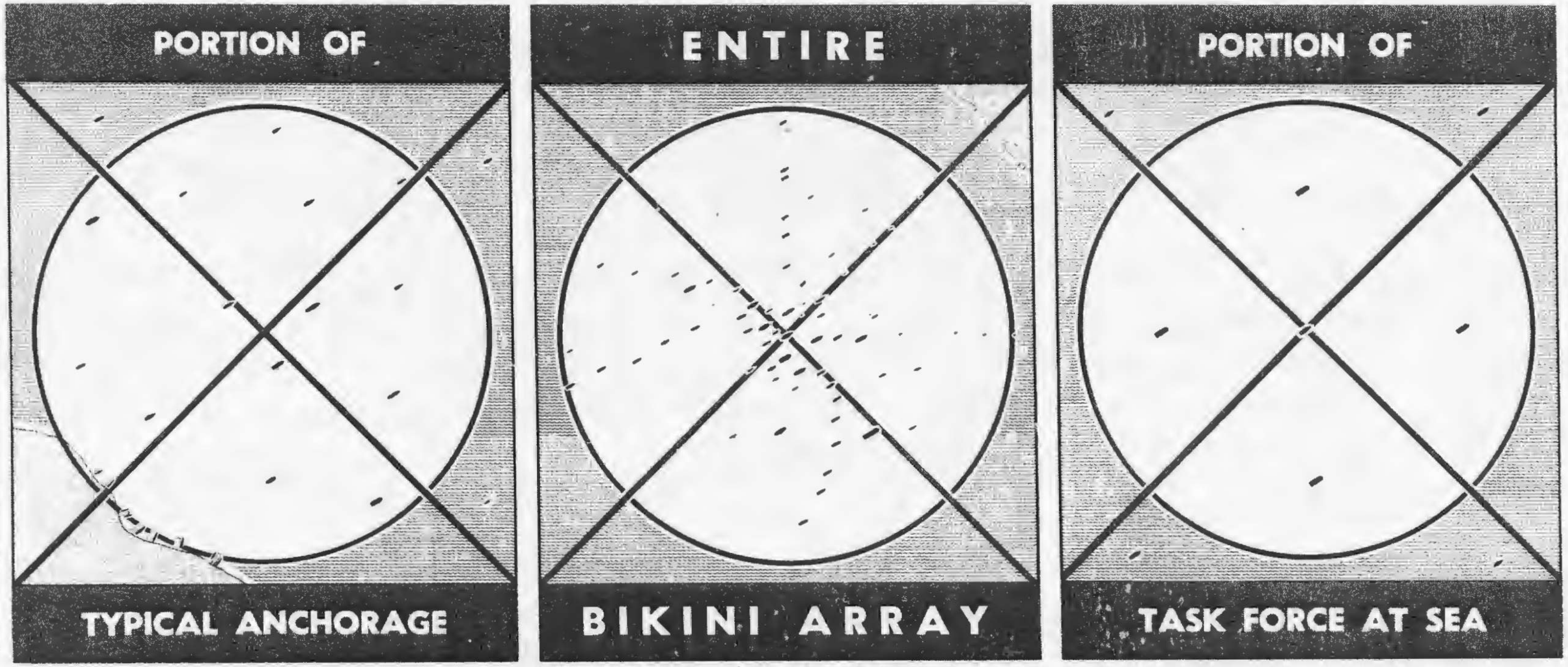
DD	DESTROYER	LST	LANDING SHIP TANK	LCM	LANDING CRAFT MECHANIZED
SS	SUBMARINE	LCI	LANDING CRAFT INFANTRY	ARDC	FLOATING DRYDOCK
APA	ATTACK TRANSPORT	LCT	LANDING CRAFT TANK	B	BARGE

JOINT ARMY-NAVY TASK FORCE ONE

"OPERATION CROSSROADS"

FIRST ATOMIC BOMB TEST

**CONCENTRATED SHIPS IN TARGET ARRAY AT BIKINI
COMPARED WITH TWO NORMAL WARSHIP ARRANGEMENTS**



ARRANGEMENT AND CONCENTRATION OF SHIPS AT BIKINI INSURES GRADUATED DAMAGE

WAR DEPARTMENT
Bureau of Public Relations
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May 15, 1946

IMMEDIATE RELEASE

JOINT ARMY-NAVY RELEASE

The Army and Navy Munitions Board, which is charged with formulating plans for the industrial mobilization of the country in the event of an emergency, has undertaken a survey of underground sites throughout the nation which might be utilized for long-term storage of machine tools and war production equipment and which, if necessary, may be adaptable in war-time for vital industrial production and other military purposes.

The survey is only one phase of the extensive program being carried on by the Board which consists of the Board's Executive Chairman, Mr. Richard R. Deupree, President of Procter and Gamble, and a distinguished industrialist; the Under Secretary of War, the Honorable Kenneth C. Royall; and the Assistant Secretary of the Navy, the Honorable W. John Kenney. The Executive Chairman is the chief executive of the Board. Its operating personnel are chosen from specially qualified officers and civilians from the War and Navy Departments.

It is the responsibility of this Board, working with other government departments and industrial management and labor groups, to make plans which will best assure the national security, and full application of the nation's economic strength toward meeting military requirements in the shortest possible time in the event of an emergency.

The War and Navy Departments have no present intention of recommending the placement of any industries underground. It is the primary purpose of this survey to locate underground sites suitable for the safe and economical storage of many of the vital items of machine tools and mechanical equipment owned by the government which would otherwise require extensive surface storage facilities. In the course of this study, in addition to the storage feature, the survey may develop certain sites which, in the event of an emergency, would be particularly adaptable for housing vital industries should this step become necessary.

Army engineers, working under the direction of a special committee of the Board, will do the actual cataloging of the underground areas and will grade them according to their various characteristics. Both natural caves and man-made caverns such as mines are to be studied.

Among the characteristics to be recorded are floor space, ceiling, humidity, overhead cover, soil and rock conditions, access approaches and general interior conditions. Other factors which will be considered are concealment from aerial observation, and proximity to transportations, communications, utilities and housing facilities.

The Board's Committee on underground sites functions as a coordinating agency between the War and Navy Departments and other government and private agencies with regard to planning for the use of underground areas. At the

MORE

conclusion of t survey, the Committee will make recommendations (the Board on the extent to which the use of underground areas is desirable, and on the practicability of placing industrial machinery and materials in such locations. In addition, the Committee will estimate construction and alteration costs for any program recommended.

Meanwhile, other special committees of the Board are proceeding with programs designed eventually to simplify and standardize the problems of industrial mobilization.

Among the more important is the Strategic Materials Committee, comprised of representatives of the War and Navy Departments and the Departments of State, Treasury, Interior, Agriculture, and Commerce, and the Civilian Production Administration. This Committee makes recommendations as to what materials are to be classified as strategic and critical, and how funds made available by the Congress for the purchase of stockpile materials are to be utilized. It recommends the kinds, quantities, and specifications of such critical materials.

Another activity is the Joint Army and Navy Specifications Board, its objective being the coordination and development of joint Service specifications on items, materials, processes, and standards issued by the War and Navy Departments. Wherever possible, this Board will establish joint Army-Navy standards for capacity, dimensions, and test.

The Joint Procurement Assignment Committee investigates for the Board existing or potential duplications of procurement between the two Services. Where appropriate, it recommends to the Board the assignment of the responsibility for purchase of specific items or classes of items to either the War Department or to the Navy Department. It also recommends appropriate standardization of items or classes of items between the Army and Navy.

The Board has also set up an Industrial Facilities Committee which is to advise on all matters related to the establishment of such facilities for the peacetime Army and Navy and nucleus for operation and expansion in case of a future emergency. The Committee will make recommendations on legislation required to place War or Navy Department or Reconstruction Finance Corporation-owned industrial facilities into the active or standby categories of the peacetime program, on the designation of industrial facilities that should be included in the program under the ownership of the War or Navy Departments, the selection of basic industries that should be included in the program, and the coordination required with civilian industry to supplement the program.

Another Committee coordinates the activities of the Army Packaging Board and the Navy Packaging Board to resolve differences between them. It insures to the greatest extent feasible the adoption of uniform instructions related to packaging and packing, insures a uniform interpretation of specifications and recommends, where necessary, the revision of such specifications.

The Ordnance Procurement Committee was established by the Board to consider joint ordnance procurement problems in light of the experiences of World War II. Its objective is to bring about maximum standardization and maximum practical economies from joint procurement or single procurement for both services.

Other Committees of the Board deal with lumber, the procurement of medical and surgical equipment and supplies, requirements of basic and raw materials, components and end products, and the procurement and standardization of marine equipment and supplies.

END

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May 21, 1946

I M M E D I A T E R E L E A S E

LAST SHIPMENT ENROUTE TO TASK GROUP 1.5 FOR ATOM TEST AT BIKINI

Establishment of Task Group 1.5 as an operational unit at Kwajalein and embarkation of the last shipment of personnel and equipment to this unit have completed the preparatory mission of the "Operations Crossroads" Office in the Strategic Air Command at Bolling Field, Brigadier General Frederic H. Smith, Jr., Chief of Staff, said today.

Charged with the responsibility of supervising and expediting the manning, equipping, training, and preparing for overseas movement of Task Group 1.5, the SAC "Crossroads Office," headed by Lieutenant Colonel Brian "Shanty" O'Neill, accomplished its task in a "highly commendable fashion, particularly in face of the time element and the difficulties presented by rapid demobilization," General Smith said.

Preliminary Army Air Forces preparation for the atomic bomb tests required that the Strategic Air Command unit fill the personnel requirements of 422 officers and 3237 enlisted specialists, deliver 10,000 tons of diversified equipment to ports of embarkation, and obtain 40 specially modified aircraft for participation in the event.

The SAC Operations Crossroads office was established at Bolling Field on January 15, 1946, under what was then the Continental Air Forces. The immediate task was the establishment of a manning table for Task Group 1.5 and the transfer of qualified personnel to this group at Roswell, New Mexico. The entire AAF was combed to secure the necessary specialists remaining in the rapidly demobilized organizations.

Project officers were appointed in the major depots of the country to help meet the March 1 sailing date for the initial 8,000 tons of material, including maintenance, communication, ordnance, photo laboratory, and other necessary equipment.

Colonel O'Neill and his staff also provided the necessary training facilities and equipment for the Task Group at Roswell and made periodic checks on the progress of this training.

Finally the Strategic Air Command unit prepared the movement orders to the Pacific for Task Group 1.5 and accomplished the delivery of all personnel and equipment to the Port of Embarkation.

On Colonel O'Neill's staff were Lieutenant Colonel W. O'Hern, Hennessey, Oklahoma; Lieutenant Colonel J. H. Bell, Oil City, Pennsylvania; Major J. H. Inghan, San Leandro, California; Major K. A. Linklater, Hillsboro, Oregon; Captain Michael Alessandro, Temple, Texas; Lieutenant Arline Walker, New York City, and Private first class Helen P. Keuther, Cincinnati, Ohio.

Colonel O'Neill, of New York City, was wing commander of the 309th Heavy Bomb Wing with the Fifth Air Force in the South Pacific during the war. He was awarded the Distinguished Service Cross, Legion of Merit, and Air Medal during his two tours of duty as a pilot of a Martin B-26 Marauder and a North American B-25 Mitchell.

END

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3:30 P.M.

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May 28, 1946

I M M E D I A T E R E L E A S E

MAJ. GEN. LEMAY PLANS
PITTSBURGH ADDRESS

Major General Curtis E. LeMay, Deputy Chief of the Air Staff for Research and Development, will discuss "The Atomic Bomb and Future Air Development" at a "Peaks of Progress" breakfast, June 1, in Pittsburgh.

A group of scientists and educators will attend the breakfast, which is an annual fete in commemoration of progress achieved by mankind in the preceding year.

END

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4:15 PM

FUTURE RELEASE
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F U T U R E   R E L E A S E

FOR RELEASE IN AFTERNOON PAPERS OF WEDNESDAY JUNE 12, 1946.

SEE A-BOMB SHOCK WAVES
RENDERING CAVES USELESS

Shock-wave studies which may make even caverns deep underground untenable in atomic war are being carried on at the Ordnance Ballistics Research Laboratory at Aberdeen Proving Ground, Maryland, the War Department announced today.

Using complicated electrical hookups, laboratory scientists are examining shock waves in connection with atomic fission experiments, and will apply what already is known to lessons learned at next month's A-bomb explosion at Bikini Atoll, in mid-Pacific.

Colonel Leslie E. Simon, director of the Aberdeen Laboratory, asserted that after results of the Bikini blast are compiled, "we can determine at what height an A-bomb should be exploded to crush solid rock to a depth of 150 to 200 feet."

Heretofore, deep underground installations were believed to be the only effective preventative measure against an atomic explosion.

The studies, which are based on the performance of shock waves in both earth and water, are a continuation of experiments made during the war on shock waves in air, according to Colonel Simon.

A twenty-four channel recording cathode ray oscillograph is used in determining the extent of the shock waves.

The Ordnance Section of Operation Crossroads, which will observe the effects of the A-bomb at Bikini, had its blast instruments calibrated, special instruments built and its crew trained at Aberdeen Proving Ground.

END

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FUTURE RELEASE
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F U T U R E   R E L E A S E

FOR RELEASE FRIDAY A.M., JUNE 14, 1946

FIRST PEACETIME APPLICATION OF ATOMIC RESEARCH
BECOMES IMMEDIATELY POSSIBLE UNDER ARMY PROGRAM

The first peacetime application of the results of wartime atomic research becomes immediately possible with announcement today of the availability of radio-isotopes for biological and medical research.

Manhattan Engineer District of the War Department, which developed the atomic bomb, made public the details of a program for the nationwide distribution of the beneficial radioactive isotopes to be produced from the uranium chain-reacting "atom pile" at the Clinton Engineer Laboratories, Oak Ridge, Tennessee.

The announcement is a major step forward in the Army's plan to make available as rapidly as possible the full benefits of the long secret undertaking. It is the fourth in a series to bring about the maximum utilization for non-military purposes of the war's major scientific development. Previous announcements have dealt with the Clinton Laboratories experiments on electric power generation, the extensive atomic research program to be carried out at Hanford, Washington, by General Electric Company, and the ordering of a 100-million volt betatron--atom smasher--for Oak Ridge.

The radioactive isotopes to be made available will be used in research work in fundamental and applied sciences, particularly in biology and medicine. They have been generally heralded as making possible the greatest peacetime benefits to result from atom researches. They will be used in two important ways: First as tracer atoms or "tracers," for following the course of atoms in chemical, biological and technical processes; and possibly second, after considerable research, as therapeutic agents for treatments of certain special diseases.

Distribution will be coordinated and supervised by an Advisory Committee on Isotope Distribution Policy, members of which were appointed by Major General L. R. Groves, Chief of the Manhattan Project, on the recommendation and nomination by the National Academy of Sciences. To judge radioisotopes' requests and recommend distribution, this Advisory Committee will have sub-Committees on Allocations and on Human Applications. A technical committee on isotopes composed of representatives from the major laboratories of the Manhattan Project will aid the Project in coordinating production and development of requested isotopes.

The announcement, which followed many months of coordinated effort among scientists of the Manhattan Project at the Government facilities at Clinton Laboratories, at the University of California, at the University of Chicago and Iowa State College, in developing methods and arranging for production, said that the increased and general distribution of the radioactive isotopes may well have far-reaching importance in peacetime research in physics, chemistry, metallurgy and the medical sciences.

The radioisotopes--which are radioactive forms of common elements with the same chemical properties of the stable element but having a different atomic weight--will be prepared largely in the Clinton Laboratories operated for the Army by the Monsanto Chemical Company. The bombardment facilities of the Hanford Engineer works at Pasco, Washington, now operated by the du Pont Company and which will be taken over by the General Electric Company around September 1 will also be used

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In accordance with the policies recommended by the non-project advisory group only qualified institutions such as accredited hospitals, universities, recognized research laboratories including industrial research laboratories, and clinical investigation groups will be able to obtain the radioactive material. An additional qualification will require all groups using the isotopes for fundamental research or applied science to publish or otherwise make available their findings, thereby promoting further applications and scientific advances.

The Manhattan District has set up a special Isotopes Branch in its Research Division to administer and coordinate the distribution program in cooperation with the scientific committees nominated by the National Academy of Sciences. Dr. Paul C. Aebersold, formerly of the Project's Radiation Laboratory of the University of California and formerly engaged in work with cyclotron-produced radioisotopes, was named chief of the branch.

A group of scientists working at Clinton Laboratories has been doing extensive research to develop suitable production methods. These methods are necessarily far from simple; they deal with minute quantities of the end product and are most difficult, somewhat hazardous and costly to produce. The availability of radioactive isotopes from the Project for non-project distribution, it was pointed out, is possible only through the research, development and production efforts of the many technical personnel in all parts of the Project.

The basis for the final plans for the distribution program was given a number of months ago when the National Academy of Sciences, at General Groves' request, nominated a representative committee of outstanding scientists to recommend policies and help make arrangements for a scientifically desirable distribution of radioactive isotopes to non-project groups. General Groves felt "most strongly" that the Project should <u>not</u>, without strong outside scientific aid, undertake to determine eligibility and policy on distribution matters concerning non-project organizations. It was on that basis that the National Academy of Sciences nominated the Interim Advisory Committee on Isotope Distribution Policy, headed by Dr. Lee DuBridge, in charge of the Physics Department of the University of Rochester and who recently was appointed to become president of the California Institute of Technology at Pasadena.

It was pointed out by Dr. Aebersold, Project coordinator of the distribution program which is being announced, that the program is an unprecedented effort on a national scale and that many problems are expected which will have to be handled as they arise.

In this connection, it was emphasized that it will probably be impossible to meet all of the demands of the country until additional pile facilities are built specifically for radioactive isotope production. This is not contemplated in the immediate future. It was also stated that it might be possible, although no production scale steps have been taken, for the electromagnetic facilities developed for concentrating U-235 at Oak Ridge to enter the isotope production program in the future by concentrating non-radioactive stable isotopes. Concentrated stable isotopes can be used as tracer atoms by means of a mass spectrometer system. They are also uniquely valuable in studying properties of the atomic nucleus. Present plant equipment is <u>not</u> immediately suitable for concentration of desired isotopes on a wide scale, and the processes are still very expensive.

Under the program being announced, approximately one hundred radioactive isotopes will be obtainable in varying quantities. Some of the most important of these include Carbon 14, Sulphur 35, Phosphorus 32 and Iodine 131. The numbers following the name of the element refer to the mass of the isotope, that is to the total of protons plus neutrons in the nucleus. Ordinarily stable carbon consists of isotopes of mass 12 and 13, Sulphur of 32, 33 and 34, Phosphorus of 31 and Iodine of 127.

Since Carbon is one of the principal elements found in organic material, the Isotope Carbon 14 is expected to give great impetus to the study of all organic processes including the mechanism and growth of normal and abnormal tissues and all plant and animal functions. In the medical field, at least initially, isotopes

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In this connection, it was emphasized that it will probably be impossible to meet all of the demands of the country until additional pile facilities are built specifically for radioactive isotope production. This is not contemplated in the immediate future. It was also stated that it might be possible, although no production scale steps have been taken, for the electromagnetic facilities developed for concentrating U-235 at Oak Ridge to enter the isotope production program in the future by concentrating non-radioactive stable isotopes. Concentrated stable isotopes can be used as tracer atoms by means of a mass spectrometer system. They are also uniquely valuable in studying properties of the atomic nucleus. Present plant equipment is <u>not</u> immediately suitable for concentration of desired isotopes on a wide scale, and the processes are still very expensive.

Under the program being announced, approximately one hundred radioactive isotopes will be obtainable in varying quantities. Some of the most important of these include Carbon 14, Sulphur 35, Phosphorus 32 and Iodine 131. The numbers following the name of the element refer to the mass of the isotope, that is to the total of protons plus neutrons in the nucleus. Ordinarily stable carbon consists of isotopes of mass 12 and 13, Sulphur of 32, 33 and 34, Phosphorus of 31 and Iodine of 127.

Since Carbon is one of the principal elements found in organic material, the Isotope Carbon 14 is expected to give great impetus to the study of all organic processes including the mechanism and growth of normal and abnormal tissues and all plant and animal functions. In the medical field, at least initially, isotopes will yield their greatest benefits not directly in treatment of disease but as tools for finding the causes of diseases.

<u>MORE</u>

2-B

Phospho , which is important in plant and animal metabol . and human hemotology, is also expected to reveal many biological secrets through experimental use of its isotope--Phosphorus 32. At the same time, Sulphur 35 may be used in tracing reactions of sulpha drugs. Radioiodine is valuable because of its specific incorporation in thyroxin and thus can be used to study functions of the thyroid gland. These isotopes may also be useful as tracers in industrial chemistry and metallurgy.

The availability of radioisotopes, means of requesting, and arrangements for their allocation and distribution are now being announced in technical detail in the publications of the American Association for the Advancement of Science. (The publication SCIENCE) Briefly, the procedure follows:

a. All requests must be initiated from accredited research groups or educational institutions.

b. All requests will be initially received by the Isotopes Branch, Research Division, Manhattan District, P. O. Box E, Oak Ridge, Tennessee, where a technical review will be initiated on each request in regard to all technical questions arising between the supplier and the applicant.

c. Each request will then be referred to the Allocation sub-Committee, which will have the responsibility of advising on the allocation and distribution of isotopes according to the scientific value of the proposed research. The sub-Committee will operate under the supervision of the Advisory Policy Committee which was nominated by the National Academy of Sciences.

d. Requests for material for use in humans will be referred to a sub-Committee on Human Applications which will have final veto power on any distribution suggested for human applications.

e. Small "Panels of Consultants" in a number of specialized fields of possible applications of isotopes will be appointed to afford advice as deemed necessary on scientific matters connected with requests.

f. Effective liaison will be established between the Manhattan Project technical groups and the associated advisory groups whose functions are described.

A reasonable charge will be made for all isotopes to cover the "out-of-pocket" costs to the United States resulting from the additional production incurred by the non-project distribution. Prices will be determined on the basis of projected, routine production processes. Although many isotopes are expensive to produce, especially if desired in a pure form, research-program quantities of important isotopes should not be prohibitively expensive to the average scientific institution. It is planned to make materials available more rapidly and in greater quantity as well as to reduce costs, by supplying the bombarded material when possible without subsequent chemical processing by the Project.

Many radioactive isotopes were available from cyclotrons before the war but in limited quantities. While a pile cannot produce as many varieties of radioactive isotopes as a cyclotron, because it can only bombard with neutrons while cyclotrons can use many nuclear projectiles, a pile can far outdistance a cyclotron in quantity production of certain isotopes. For some things, like Carbon 14, the pile can be made equivalent in production to hundreds of cyclotrons.

The paucity of isotopes under the cyclotron processes before the war limited the scope of research done and the number of persons using radioisotopes. Nevertheless, many important results, particularly in biology and medicine, came from the use of the isotopes available. Now, with the prospect of radioactive isotopes being made available on a large scale, even more important advances are expected in all sciences by their use.

More than 400 man-made radioactive isotopes are now known. There is at least one such radioisotope for each element. The "Trans-plutonium" elements, 95 and 96, are radioisotopes recently found in Project researches. The work in connection with the Plutonium Project of the Atomic Bomb Development has resulted in the production, or possibility of production, of a considerable number of radioactive isotopes but [illegible]

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MORE

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NON-PROJECT ADVISORY COMMITTEES ON ISOTOPES
(Nominated by National Academy of Sciences)

Interim Advisory Committee on Isotope Distribution Policy:

Dr. Lee A. Du Bridge - Chairman
University of Rochester, Rochester, New York

Dr. Merle A. Tuve
Carnegie Institution, 5241 Broad Branch Rd., N. W., Washington, D. C.

Professor Linus G. Pauling
Chemistry Department, California Institute of Technology, Pasadena, California

Dr. Vincent du Vigneaud
Cornell University Medical College, York Avenue and 69th Sts., New York, New York

Dr. Raymond E. Zirkle
Department of Botany, University of Chicago, Chicago, Illinois

Dr. A. Baird Hastings
Department of Biochemistry, Harvard Medical School, Cambridge, Massachusetts

Dr. Cecil J. Watson
University Hospital, University of Minnesota, Minneapolis, Minnesota

Dr. Cornelius P. Rhoads
Memorial Hospital, 444 E. 68th St., New York, New York

Dr. Zay Jeffries
General Electric Company, 1 Plastics Avenue, Pittsfield, Massachusetts

Dr. L. F. Curtiss
National Bureau of Standards, Department of Commerce, Washington, D. C.

Dr. Paul C. Aebersold - Secretary

Sub-Committee on Allocation and Distribution:

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Harvard, Boston, Massachusetts

Dr. J. G. Hamilton, M. D. and Biologist,
University of California, Berkeley, California

Dr. Joseph W. Kennedy - Chemist,
Washington University, St. Louis, Missouri

Sub-Committee on Human Applications:

Dr. Andrew Dowdy - Chairman,
University of Rochester, Rochester, New York

Dr. Hymer Friedell,
Western Reserve University, Cleveland, Ohio

Dr. Gioacchina Failla,
Columbia University, New York, New York

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FUTURE RELEASE

FOR RELEASE IN P.M. PAPERS, FRIDAY, JUNE 14, 1946

OPERATIONS CROSSROADS TO TEST
ORDNANCE MATERIAL, AMMUNITION

Plans and preparations for Army Ordnance participation in the OPERATION CROSSROADS, are being made with as much thoroughness as those for an amphibious invasion of enemy territory. The Joint Army and Navy Atomic bombings at Bikini Atoll will test the reaction to atomic blasts of over 100 different Ordnance materiel and ammunition items as well as the U.S. Navy vessels which carry them.

When OPERATIONS CROSSROADS was proposed, it was decided to form Army Technical Groups parallel to those of the Navy to coordinate all items to be tested by Atomic bombing. Colonel J. D. Frederick, Infantry, was appointed Commanding Officer of the Army Ground Group, with Colonel J. H. Weber, Ordnance Department, former Chief of the Rocket Division at Aberdeen Proving Ground, as his Executive Officer.

The Ordnance Section of OPERATION CROSSROADS will consist of a Technical Staff of five officers especially qualified in various types of Ordnance materiel and nine test teams. Each team will be commanded by an officer and will consist of enlisted specialists in tanks, automotive vehicles, artillery, fire control equipment, small arms, aircraft armament, and ammunition. Lieutenant Colonel Sidney F. Musselman of Cynthiana, Kentucky has been appointed Chief of the Ordnance Section.

Ordnance equipment will be assigned to nine ships in the Crossroads target array holding positions ranging from the immediate vicinity of the atomic blast to the estimated extreme radius of damage.

Identical 200 ton sets of Ordnance items will be loaded on the USS NEVADA, USS ARKANSAS, USS PENNSYLVANIA and the USS SARATOGA. All the ammunition will be transported to the Pacific on the USS ARTEMIS, and there divided into five identical lots and transferred to five LST's.

Compared with the atomic bomb, ordinary ordnance projectiles have the potency of cream puffs; but it was decided to separate the materiel items from the ammunition shipments in order to obtain a true evaluation of the damage done to vehicles and weapons by the atomic blast without benefit of minor local explosions.

A minimum number of items of ordnance materiel and ammunition has been selected to exemplify all types of materiel and ammunition. Forty-five different items of material and 99 of ammunition, including anti-tank mines, bombs, and artillery ammunition of all kinds, will be tested. Each item has been

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battle tested, with the exception of a special 4000-pound bomb that is being prepared for the test.

Materiel items will be exposed on ship deck in field operating conditic Ammunition will be displayed in several stages of preparation. Some will be packed in original shipping containers as it is stored in ammunition dumps; some in bulk containers; and the rest will be exposed in operating condition just as it is used by the troops.

Ordnance experts can only speculate as to the results of the experiment They know that Ordnance items, such as tanks and artillery, have been constr ted to stand up under severe battle strain. But the atomic bombings will produce conditions entirely different from any which have existed during pre tests.

The atomic blast is not an ordinary explosion. Ordinary bomb blasts de a few thousand degrees of temperature while the atomic blasts will develop temperature running into the millions. Atomic pressure is enormously greate than that produced by any other means because the bombs pack more energy tha any other known object of like size can hold.

Because of the importance of the experiment, the Ordnance Department ha combed its personnel throughout the Pacific and the United States to secure thoroughly qualified specialists to take part in the operation.

The team commanders have already been briefed in Washington, D. C. rega: the scope of the operation and their duties and responsibilities. Training the teams will take place at the ports and aboard the ship. Each specialist will execute and maintain individual records of each piece of equipment, cov its maintenance, inspection and repair. Photos will be made of the equipmen before the detonation of the atomic bombs. Immediately after the test, ordn teams will make detailed inspections and prepare complete reports of effects the explosion. Staff officers will coordinate the team reports into a compl historical record of the Ordnance phase of the Crossroads Operation.

Representative samples of all Ordnance materiel subjected to the bomb w be returned to Ordnance arsenals and laboratories in the United States for m exhaustive study than is possible in the field. Effects of the atomic bomb visible to the naked eye which alter the strength, stability or functioning characteristics of materiel will be recorded and included in the final report

Lieutenant Colonel Herbert H. Daubert, of Houston, Texas and New York Ci has been appointed to the Technical Staff in charge of Tank and Automotive ec ment;Major Gilvary P. Grant of Salt Lake City, Utah will represent Small Arms and Aircraft Armament materiel on the staff; Major Leon E. Clark, Birmingham, Alabama will control all Army Fire Control Equipment; Captain Ernest B. Bucha Boston, Massachusetts will have charge of all Ammunition and Captain Austin Haley, Seattle, Washington has been appointed to the Technical staff in charg of Artillery materiel and general operations.

END

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June 26, 1946

MEMORANDUM FOR THE PRESS:

The following press release issued by the War Department Public Relations Division for use in Sunday papers of June 30, 1946, may be published or broadcast at any time after 6:00 P.M., EST, Saturday June 29, 1946:

1. Manhattan Project Reports on Atom Bombing of Hiroshima and Nagasaki.

2. The Atomic Bombings of Hiroshima and Nagasaki by The Manhattan Engineer District.

3. Photographs of the Atomic Bombings of Hiroshima and Nagasaki by The Manhattan Engineer District.

END

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F U T U R E R E L E A S E

FOR RELEASE IN P. M. PAPERS, FRIDAY, JUNE 28, 1946

RADIO-ACTIVE URANIUM ISOTOPES
OPEN UP UNEXPLORED PROCESSES OF LIFE

An "x-ray" of the dynamic processes of living now is available to medical research.

Possibility of obtaining for the first time relatively large amounts of radio-active isotopes through the uranium piles of the Manhattan District brings basic biological investigation to a new frontier, according to a statement today by Major General Norman T. Kirk, Surgeon General of the Army, whose office will cooperate in the distribution of the materials to Army Hospitals.

The Surgeon General said requests for these materials should come from accredited research groups or educational institutions and should be directed to Isotopes Branch, Research Division, Manhattan District, P. O. Box "E", Oak Ridge, Tennessee.

Isotopes as tools of medicine have been compared to the microscope and the x-ray, General Kirk pointed out. But these were useful largely for study of the organs of life whereas the isotopes open up the largely unexplored field of the processes of life. It is in this respect, rather than as actual remedies for anything, that the substances are of preeminent importance today.

"Medical scientists", said General Kirk, "would like to know more about how calcium and phosphorus are used in building teeth and in uniting fractures, how iodine is used by the thyroid gland, exactly what happens when one or more of the glands of internal secretion starts malfunctioning, how the process of wound healing is carried out".

Such questions and hundreds of others whose answers now are among the secrets of life wait upon radio-active isotopes for clarification, he pointed out. Elements such as calcium, phosphorus, sulphur, iron and a score of others can be "tagged" with small amounts of the isotopes and followed through the body through their emission of beta and gamma radiation. The latter is the same as x-radiation.

Some of these radio-active isotopes may find a place as specific "medicine", medical officers point out. The most notable example to date is radio-active phosphorus, known chemically as P32. Phosphorus is an important constituent of both bones and blood. It is carried in the blood stream through the entire body. When the radio-active isotope is administered the blood stream is subjected to a radium-like bombardment. Consequently when the isotope was produced first in the cyclotron about seven years ago there were high hopes that it might mark a long advance towards the conquest of leukemia -- a cancer-like condition of the blood in which there is an enormous increase in white bolld cells which, however, do not have the ability of ordinary cells of this sort to combat infection. Despite various complications and disappointments, use of P32 now is generally accepted as the treatment of choice for certain forms of leukemia. It brings about long remissions of the disease. It cannot be considered a "cure" for any leukemic condition in the present stage of the therapy but it is admittedly a long step in

MORE

advance in the treatment of one of the most difficult maladies known to medical science.

The element iodine tends to concentrate in the thyroid gland. Since radio-active iodine behaves exactly the same as ordinary iodine in the body it was logical that it should be tried in malignant growths of the thyroid. Results to date have been somewhat puzzling and inconclusive. The same is true of other radio-active isotopes which have been tested for specific therapy.

But this whole field of medicine still is almost unexplored and physicians naturally are proceeding with great caution until they know more about specific effects and possible complications. Even if all prospects for the therapeutic use of isotopes fail to materialize, General Kirk stressed, the importance of a relatively abundant supply of these materials remains preeminent.

Any element — 96 now are known — is a combination of infinitestimably minute elementary particles. Those are protons, each carrying one charge of positive electricity; electrons, each carrying one charge of negative electricity; and neutrons, which are not electrically charged.

The nucleus of an atom is made up of protons, electrons and neutrons. Revolving around the nucleus somewhat as planets revolve around the sun, are electrons. There are precisely the same number of electrons revolving around the nucleus as there are protons in the nucleus which are not balanced by nuclear electrons. The number of outer electrons is the atomic number.

But there may be an extra neutron in the nucleus. It weighs precisely as much as a proton. It is electrically neutral. Hence it does not leave room for an extra outer electron. The atomic number remains the same. Element 92, which is uranium, remains uranium so long as there are 92 outer electrons. But with an extra neutron in the nucleus it weighs more. This heavier uranium is known as an isotope. Chemically it acts precisely the same as any other uranium.

For reasons not clearly understood various nuclear combinations are unable to stick together and break up with considerable violence. They then are radio-active, shooting out radiations which can be detected by means of various devices. Chief of these is the so-called Geiger counter. By means of it the presence of radio-active atoms anywhere in the body can be detected. For example, a person is given something containing radio-active copper, by mouth. The counter will enable a physician to follow the course of this copper through the entire process of assimilation by the body.

END

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F U T U R E   R E L E A S E

FOR RELEASE IN A.M. PAPERS, SUNDAY, JUNE 30, 1946

MANHATTAN PROJECT REPORTS ON ATOM BOMBING OF HIROSHIMA AND NAGASAKI

Official investigation of the results of atom bomb bursts over the Japanese cities of Hiroshima and Nagasaki revealed that no harmful amounts of persistent radioactivity were present after the explosions, according to the report of the Manhattan Project, the War Department's agency for development of the bomb.

The effects of the atomic bombs on human beings were of three main types:

(1) Burns, including "flash" burns caused by the instantaneous heat and light radiation, "remarkable for the great ground area over which they were inflected."

(2) Mechanical injuries, resulting from flying debris, falling buildings, and blast effects.

(3) Radiation injuries, due entirely to gamma rays and neutrons emitted at the instant of explosion and similar to the results of severe X-ray overexposure.

The preliminary estimates that the general effect of an atomic bomb would be generally equivalent to an explosion of 20,000 tons of TNT were borne out by the detailed studies.

These were among the main conclusions of the report which Major General L. R. Groves, Commanding General of the Manhattan Project, submitted to the Secretary of War. The information was compiled by a Special Manhattan Engineer District Investigating Group made up of a staff of officers, military engineers, and scientists, supplemented by data from the U. S. Strategic Bombing Survey, the British Mission to Japan and the Joint Atomic Bomb Investigating Group (Medical).

The report makes public for the first time the reasons for the selection of the targets, a full description of the nature of an atomic explosion, characteristics of the damage caused by the atomic bomb, and the types of injuries suffered by human beings. It is entirely factual throughout and contains no conjecture as to the ultimate possibilities of the bomb, no predictions for the future and little discussion of possible precautionary or defensive measures.

Evidence that the bombing missions were well carried out is contained in the statements that "In respect to the height of burst, the bombs performed exactly according to design; the bombs were placed in such position that they could not have done more damage from any alternative bursting point in either city; and, the heights of burst were correctly chosen having regard to the type of [illegible]"

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F U T U R E　　　　　　　　　　　　　　　　　　　　　　　　R E L E A S E

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The information collected by the investigators would make possible a reasonably accurate prediction as to the blast damage likely to be caused in any city where an atomic explosion took place, the report states.

The approximate date for the first use of the bomb was set in the fall of 1942 after the Army had taken over the direction of and the responsibility for the atomic bomb project.

"At that time, under the scientific assumptions, which turned out to be correct, the summer of 1945 was named as the most likely date when sufficient production would have been achieved to make it possible actually to construct and utilize an atomic bomb. It was essential before this time to develop the technique of constructing and detonating the bomb, and to make an almost infinite number of scientific and engineering developments and tests. Between the fall of 1942 and June, 1945, the estimated probabilities of success had risen from about 60 per cent to above 90 per cent; however, not until July 16, 1945, when the first full-scale test took place in New Mexico, was it conclusively proven that the bomb would be successful."

The work of selecting targets for the atomic bombs began in the spring of 1945, according to the report, and was done by bombing experts from the Air Forces, military explosives specialists, mathematicians, theoretical physicists, and intelligence agencies. The problem involved the range of aircraft, weather, desirability of visual bombing, primary and secondary targets, morale effect upon the enemy, and the maximum military effect with a view to shortening the war.

Hiroshima was a communications center, was headquarters of the Second Japanese Army, was used as a troop assembly point, had munitions plants, was a port, and 75 per cent of its population of 255,000 lived in a densely packed area of wooden structures with a few earthquake-proof, reinforced concrete buildings. The frames of the latter withstood the blast, but the buildings were rendered useless and afforded no protection for the occupants.

Nagasaki had most of the target characteristics of Hiroshima but the pattern of damage differed from that at Hiroshima because of hills which deflected the blast and reduced the area of destruction. Hiroshima lies on the broad, flat delta of the Ota River.

In Hiroshima, almost everything up to about one mile from X—ground point directly below burst—was completely destroyed, except for the reinforced concrete buildings, whose interiors were gutted and doors, sashes, frames and all windows were ripped out.

In Nagasaki, 2,000 feet from "X", reinforced concrete buildings with 10-inch walls and 6-inch floors were collapsed; reinforced concrete buildings with 4-inch walls were standing but badly damaged. At 2,000 feet, some 9-inch concrete walls were completely destroyed.

Windows were broken as far as 12 miles from the blast in Nagasaki.

In Hiroshima, more than 60,000 of the estimated 90,000 buildings were destroyed or severely damaged.

While the estimated casualties resulting from both bombings are tabulated in the report, complete details of the causes are not yet available; this phase of the bombing investigation is being prepared by a special medical mission which has not completed its report.

Hiroshima suffered 135,000 casualties, or more than 50 per cent of its population. It was comparable in size to Providence, Rhode Island, or Dallas, Texas. Nearly half, or 66,000, of the casualties were deaths, the greatest number of which occurred immediately after the bombing.

Nagasaki, a city of 195,000, suffered 64,000 casualties, of which 39,000 were deaths.

Burns caused about 60 per cent of the deaths in Hiroshima and 80 per cent in Nagasaki. Falling debris and flying glass caused 30 per cent of the deaths,

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Burns caused about 60 per cent of the deaths in Hiroshima and 80 per cent in Nagasaki. Falling debris and flying glass caused 30 per cent of the deaths in Hiroshima and 14 per cent in Nagasaki.

MORE

2-B

A T T E N T I O N

Errata: On page 19 of the report, the percentage figures in Table D total 118 per cent. They appeared this way in the Japanese reports, but an analysis of the samples on which these estimates are based gives the following:

Nagasaki	Burns	80%
	Falling Debris	8%
	Flying Glass	6%
	Other	6%

Through an oversight, this correction was not made when the report was lithographed.

END

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REMARKS BY
THE HONORABLE ROBERT P. PATTERSON, SECRETARY OF WAR,
ON THE RADIO PROGRAM "YOU AND THE ATOM"
COLUMBIA BROADCASTING SYSTEM, 10:15 P.M., EST, MONDAY, JULY 22, 1946

The name for this series of programs, "You and the Atom," is well chosen. The fact is that the atom bears the same relation to the world of material things that the individual does to the world of human beings.

It helps, I believe, if you think of the atom in individual terms, and to look at the problems with which we are now faced as between you and the atom, or between me and the atom, or your son and the atom. Unless we assume the basic individual responsibility in dealing with this newfound knowledge, we cannot fulfill our group, or national, responsibility.

You are bound up with the atom whether you want to be or not. You will control it, or face the consequences. A plan whereby you may control it has been laid before the Atomic Energy Commission of the United Nations by Bernard Baruch, and I urge every American to give his unstinting support to the proposals of Mr. Baruch, which are the proposals of the government of the United States.

Two great decisions have been made in connection with the unleashing of the forces of the atom--the two most difficult and significant decisions throughout all the period of the development of the atomic bomb. The first was when President Roosevelt said, "Make it." The second was when President Truman said, "Drop it."

We are now faced with the third decision--the decision to control it. This is the vital decision. It must be just as clear, just as unmistakable, and as resolutely and fearlessly carried out, as were those first two. But it is not a decision which can be made by one man. It must be the decision of all of the people of the United States and all of the people of the United Nations.

You must decide--and quickly--that you are willing to enter into and live up to an agreement that this universal force will not be available to any man or group of men for the purpose of war, and that its benefits will be the property of all mankind.

Men who follow me on this broadcast series will discuss the research which preceded the bomb, and the research in nuclear physics which will touch all the fields of science in bringing us the benefits of atomic development.

Dr. Charles F. Kettering, one of the greatest research men of the world, once described research as the "business of trying to figure out what you are going to do when you have to stop doing what you are doing now."

This one lesson stands out above all others in a study of atomic energy. Man now has in his hands a force so great--both in its potential for good and its potential for evil--that the time has come for him to do something else. He has to stop doing what he has been doing.

The thing that man must stop doing is resorting to armed conflict to settle his grievances with his fellow man of other tongue, of other political belief, of other culture, or of other station.

1-A

FOR RELEASE UPON DELIVERY

REMARKS BY
THE HONORABLE ROBERT P. PATTERSON, SECRETARY OF WAR,
ON THE RADIO PROGRAM "YOU AND THE ATOM"
COLUMBIA BROADCASTING SYSTEM, 10:15 P.M., EST, MONDAY, JULY 22, 1946

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The thing that man must stop doing is resorting to armed conflict to settle his grievances with his fellow man of other tongue, of other political belief, of other culture, or of other station.

The reason he must stop doing it is that he now has available for war a means of destruction great enough to destroy himself as well as his enemy, great enough to destroy the entire civilization which has produced such knowledge and power.

MORE

1-B

Do not be fooled by any talk that the atomic bomb is not as powerful as we first believed after the breath-taking announcement of Hiroshima. Don't let yourself be lulled into any false sense of security by such words as, "Oh well, its just another bomb; they'll find a defense against atom bombs!" Defenses are being studied, yes, but regardless of how potent, they can offer only partial protection, not security.

Don't discount Bikini because ships continued to float. Don't dismiss the reported devastation of Hiroshima and Nagasaki on grounds that Japanese buildings are flimsy anyway. Remember that America's great centers of population, our concentrations of industry, and our ports are vulnerable too. One atomic bomb would have done far more damage at Pearl Harbor than did the massive two-hour raid which plunged us into war.

Remember, one bomb, carried by one airplane, killed 66,000 people at Hiroshima, injured 69,000, and destroyed or damaged more than two thirds of all the buildings in a city of a quarter of a million.

I tell you that the atomic bomb is as destructive as any story written about it. Just keep in mind that only four such bombs have been exploded in history--the fifth will be exploded within a few days.

But despite the bomb's importance as a weapon, it is tragically ironic that so great a step in man's knowledge should have been taken under the impetus of war.

The Army, working through the Manhattan Project, working with the complete support of the government and people of the United States, working closely with the men of science, who initially had only the barest of theories on which to proceed, and who developed those theories with brilliant success, working also with the engineers who could apply these techniques--your Army--built and operated the facilities in which the atomic bomb was produced.

General Leslie R. Groves, who commanded the Manhattan Project, is an able Engineer Officer who assembled and operated a tremendous and efficient organization for the greatest development construction and operation program ever undertaken by any nation. The American people, I know, are proud of the work which the Army Engineers did.

This job, however, was a wartime assignment for the Army. Secretary Stimson, whose great vision and strength were so invaluable throughout this program, and I both became convinced a year ago that it would be desirable to place this in the hands of another agency of the government, specially created for the work, as quickly as possible after the war.

For nearly a year, the Army has served as a trustee, responsible to the American people, for the nation's most important single enterprise. And it is an enterprise as vital to our security as it is promising to our welfare--and the welfare of the people of the world. The Army is responsible for security but not for the peacetime development of the nation. To think otherwise is not in accord with the American tradition. I have made my views clear on this subject. I have consistently urged the passage of legislation which would relieve the Army of this broad responsibility.

The Army's sole concern is that it be enabled to work with the assistance and cooperation of the American people, in order to maintain itself in a state of preparedness sufficient to fulfill its obligations to the people. I have endorsed the McMahon Bill as adequate for this purpose.

The potential benefits of atomic development are unknown. They may be even greater than the potential for destruction. No one knows--no one can predict with any assurance. Perhaps the first great application will be in the field of biological research. The first shipment of radioactive isotopes from Oak Ridge, Tennessee, will be made this week. They will be used in medical, biological and industrial research.

In the new Argonne National Laboratory at Chicago--being established by the Manhattan District, biologists are carrying out experiments which may lead to one

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MORE

2-B

At both Hanford and Oak Ridge, experiments are planned in the generation of electric power from the energy released by the reaction of an atomic pile. Some of the same engineers who worked on the development of the bomb believe that in ten or twenty years it may be possible to deliver electric power to the bus bars of a generating station at a reasonable cost and one comparing favorably with good practice in the electric utility industry.

In order to stimulate nuclear research and to spread the knowledge and techniques of nuclear physics, the Army plans the establishment of three national laboratories to be operated in conjunction with the major universities and research institutions of the country. One such laboratory in the East, one at Chicago, and one in the West will provide the facilities---never before available---in which the nation's scientists can carry on their work.

While the Army has directed the operations of the atomic energy program for nearly a year without the guidance of any established national policy, it has endeavored to conduct the program in such a way as to realize the maximum peacetime benefits, at the same time without in any way compromising the security of the United States. The new laboratories are planned as a part of this program.

But no one agency can build the political and administrative structure which must restrain the evil of the atomic bomb and shelter the good in atomic energy.

Unless we can build such a structure to control the atom, the atom will control us. It is up to the people of the United States, to the other peace-loving people of the world, to the leaders and the people of the United Nations---truly united. It is up to the people of the United States, to you, and to me. If I might paraphrase the title of this program, "It is you or the atom."

END

DISTRIBUTION: Aa, Af, B, Da, Dd, Dm, N, Speeches.
7-19-46

WAR DEPARTMENT
Public Relations Division
PRESS SECTION, AAF
Tel. RE 6700
Ext. 74783 and 74344

July 22, 1946

I M M E D I A T E R E L E A S E

AAF SEEKING ATOMIC
PROPULSION FOR AIRCRAFT

The Army Air Forces is monitoring a cooperative effort with the Manhattan Engineering District and the U. S. aircraft engine industry to solve the problem of using atomic energy for the propulsion of aircraft.

The Fairchild Engine and Airplane Corporation of New York, New York, has been awarded the primary contract for administering the project, and is working in closest collaboration with many other aircraft engine companies, the Manhattan Engineering District, and the AAF in seeking a workable method of applying atomic power to AAF needs.

"This is only one of many problems being studied in following the AAF policy of leaving no stone unturned in seeking basic scientific knowledge to produce the best weapons possible for the defense of this country," explained Major General Curtis E. LeMay, Deputy Chief of Air Staff for Research and Development, who is directing the project.

By means of a cooperative effort by several firms, it is hoped to spread the general knowledge gained in the enterprise throughout the aircraft engine industry.

Security requirements will not permit disclosure of details of the plan, but no final solution has been found and no estimated date can be predicted for completion of the project, General LeMay added.

END

DISTRIBUTION: Aa, Af, B, Da, Dd, Dg, Dm, E, Ea, N,
5:00 PM

FUTURE RELEASE
PLEASE NOTE DATE

WAR DEPARTMENT
Public Relations Division
PRESS SECTION
Tel. - RE 6700
Brs. 3425 and 4860

F U T U R E R E L E A S E

FOR RELEASE 1:00 P.M., EST, FRIDAY, AUGUST 2, 1946

ANNOUNCEMENT OF FIRST SHIPMENT OF
RADIOISOTOPES FROM MANHATTAN PROJECT,
CLINTON LABORATORIES, OAK RIDGE, TENNESSEE

Oak Ridge, Tennessee, August 2 — New Horizons of Medical and biological research were opened today when the Manhattan Engineer District, key organization in the development of the atomic bomb, delivered the first radioactive isotopes to the nation's research institutions.

First peacetime products of the government's hugh atomic energy facilities were pea-sized units of Carbon-14, which for the next 10,000 to 25,000 years will emit 37 million beta particles per second, and will be used in research in connection with cancer, diabetes, photosynthesis, carbon deposition in the teeth and bones and in the utilization of fats by the human body.

Barnard Free Skin and Cancer Hospital of St. Louis received the first unit for study of the processes by which cancer is produced. The hospital's application was the first cleared through the necessarily elaborate distribution procedure.

Created in the chain- reacting uranium pile of Clinton Laboratories, the atomic research center here operated for the government by Monsanto Chemical Company, the unit of Carbon 14 obtained by the hospital weighed only about one ten-thousandth of an ounce. Its half-life is estimated at 10,000 to 25,000 years; in other words, starting with the year 11,946 A.D. the unit (if kept intact) should still be giving out beta particles at an average rate of 18½ million particles per second. During the elapsed time 10 billion particles will have been emitted.

Yet despite its small physical size, the unit of Carbon 14 for Barnard Hospital represents from 100 to 1000 times as much of the isotopes as heretofore made available to research in any single cyclotron-produced order. The unit was priced at $367, the actual estimated cost of production, plus handling and shipping charges, with the total cost to the hospital about $400.

Dr. E. V. Cowdry and Dr. William L. Simpson, research director and associate research director of the hospital, respectively, received the millicuie of Carbon 14 (one millicurie is that amount of radioactive material which emits 37 million disintegration particles per second. Those present included Colonel E. E. Kirkpatrick, Deputy District Engineer in charge of the Oak Ridge Project; Prescott Sandidge, Deputy Administrative Director, Clinton Laboratories; Dr. E. P. Wigner, research director of Clinton Laboratories, and the key technical personnel of the laboratories.

Others to receive similarly-sized units of Carbon 14 are:

Dr. D. Wright Wilson, University of Pennsylvania School of Medicine. He plans to study a comparison of sugar and lactic acid metabolism in normal and diabetic animals. Following the source of sugar containing radioactive atoms, he hopes to be able to unravel some of the problems of diabetes.

Dr. James Franck, 1925 Nobel Prize Winner, professor of physical chemistry at the University of Chicago, and world authority on photosynthesis. He will use

2-A

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Dr. James Franck, 1925 Nobel Prize Winner, professor of physical chemistry at the University of Chicago, and world authority on photosynthesis. He will use Carbon 14 to study the mechanisms by which plants take energy from sunlight and store it as chemical energy. Photosynthesis is responsible for most of the stored energy used by men, such as coal, oil, wood and food.

MORE

1-B

Dr. W. D. Armstrong, professor of physiological chemistry, University of Minnesota, whose investigations into the role of flourine in the enamel of teeth are widely recognized. He plans to use tagged carbon atoms to trace the deposition of carbon compounds in the dentin (inner pulp) and enamel of teeth and in bone.

Dr. I. L. Chaikoff, professor of physiology, University of California School of Medicine. He will label fats with Carbon 14 and study their utilization by the liver, muscle, blood, etc.

Colonel Kirkpatrick announced that hundreds of applicants for radioactive isotopes, including not only Carbon 14 but also many other of the 50-odd varieties producible at the Clinton Pile, have been received from the nation's leading research laboratories. He indicated that from 30 to 40 orders will be filled within the immediate future, and said several hundred additional orders are likely to be filled within the next few months.

Requests for radioelements thus far received, he said, suggest widely divergent fields of scientific interest. These include the study of:

1. Mechanisms by which cancer is produced.
2. Mechanisms by which plants utilize sunlight and carbon dioxide.
3. Disfunction of the thyroid glands.
4. Growth and composition of teeth and bones.
5. Utilization of sugar in diabetes.
6. Utilization of all essential food components.
7. The turnover of iron in anemic conditions.
8. Absorption by plants of essential elements from soil.
9. Vulcanization and polymerization of rubber.
10. Problems associated with radioactive isotopes themselves.

Dr. Paul C. Aebersold, formerly of the University of California Radiation Laboratory, and now chief of the District's Isotopes Branch, explained that plans of the various laboratories contemplate the use of isotopes in two important ways; First, as tracer atoms or "tracers" for following the course of atoms in chemical, biological and technical processes, and secondly, as possible therapeutic agents for treatment of certain special diseases.

The value of radioisotopes, however, is considered to reside more in the study of the causes of disease than in treatment. It was emphasized that radioisotope technology is at present directed mainly at fundamental investigations.

The projected use of Carbon 14 by the Barnard Free Skin and Cancer Hospital, he pointed out, offers not only an effective illustration of the material's research potential, but also of the cooperative procedures which such studies will involve.

The St. Louis institution will endeavor to "tag" component parts of cancer-producing molecules and then, through radiation measuring instruments, seek an answer to this question: "Why does this particular molecule produce cancer?" Three cooperating organizations are to participate in the investigation.

The first step will be to turn the unit of Carbon 14 over to Dr. Martin D. Kamen, co-discoverer with Sam Ruben of Carbon 14 at the University of California in 1941, now associated with the Mallinckrodt Institute of Radiology of the Washington Univeristy School of Medicine, St. Louis.

Dr. Kamen will convert the Carbon 14 from its present form in carbonate to carbon dioxide gas, and thence to acetic acid, the principal component of vinegar. The acetic acid is to be shipped to Dr. Paul Rothemund of the C. F. Kettering Foundation for the Study of Chlorophyll and Photogynthesis at Antioch College, Yellow Springs, Ohio, who will use it to prepare a cancer-producing agent (20-methylcholanthrene).

A part of the cancer-producing agent will be retained at Yellow Springs to study the chemistry of cancer producing agents, while the remainder will be used by Dr. Simpson at Barnard Hospital to study the artificial production of skin Cancer with mice being [illegible]

2-A

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MORE

2-B

A number of other kinds of radioisotopes also have been requested. Among the applicants are:

Dr. Paul Hahn, Professor of Biochemistry, Vanderbilt University, Nashville, Tennessee. Dr. Hahn has requested 100 millicuries (or one unit) of radioactive gold, which he will make into a colloid (suspension of fine particles) that will be injected into the bloodstream of an animal to study the takeup of the radioactive gold by blood cells. This is a preliminary step of an investigation into possible uses of radioactive gold in certain blood diseases, such as leukemia. He also intends to use radioactive iron in similar investigations.

Dr. John E. Christian, Professor of Pharmaceutical Chemistry, Purdue University School of Pharmacy. He has requested Phosphorus 32, or radiophosphorus, for use in development of a new technique to test the effect of various medicinal substances on absorption of phosphate from the small intestine. The same radioisotope will be used by Dr. Christian to study phosphorus depletion of teeth.

The American Smelting and Refining Company, Department of Agricultural Research, Salt Lake City. This company seeks a quantity of Sulphur 35 to aid in a fundamental study in the metabolism of plants.

The Montefiore Hospital and the Memorial Hospital, New York City, which seek radioiodine for use in clinical investigations in treatment of certain types of hyperthyriodism and certain types of cancer of the thyroid.

Professor James Cork, Physics Department, University of Michigan. He has requested radioactive antimony, arsenic and caesium, for use in fundamental nuclear physics studies.

The radioisotopes are being made available by the Manhattan Engineer District under a program announced June 14. This announcement followed many months of detailed study by the responsible heads of the Manhattan Project assisted by the scientists of Clinton Laboratories, the University of Chicago, the University of California and the University of Iowa.

It is contemplated that the radioisotopes, which are radioactive forms of common elements with the same chemical properties of the stable element but having a different atomic weight, will be prepared largely at the Clinton Laboratories operated for the Manhattan District by the Monsanto Chemical Company. The bombardment facilities of the Hanford Engineer Works at Pasco, Washington, now operated by the du Pont Company for the Government but which is to be taken over September 1 by General Electric Company, will also be used insofar as the flexibility of that operation allows. Additionally, the Argonne National Laboratory at Chicago, recently announced as the peacetime successor of the Metallurgical Laboratory, and still to be operated by the University of Chicago, cooperating with a group of midwestern universities, is aiding materially in pertinent preparations and research.

Each atomic element may occur in "sister" forms, called isotopes. An isotope differs from its sisters in the structure of the atomic "heart" or nucleus. The satellite electrons around the nucleus are arrayed the same for each element, hence the "sisters" meet the outside world and behave chemically alike. In addition to the stable sisters of elements which may occur in nature, it is possible by man-made devices, such as a pile or other atomic nucleus bombarding devices, to make isotopes which do not occur in nature and which are radioactive.

Radioactive sisters behave chemically the same as their normal stable sisters. Because of their radioactivity however, they can be followed in the processes in which they participate. Various terms have been used to indicate this property by which radioactive sisters can be followed, such as "tracer", "labeled", or "tagged" elements. By this it is meant they can be tagged much as wild fowl are banded to follow their migration. The tracer application is often also explained by an analogy with the use of tracer bullets. A tracer bullet follows the same path and arrives at the same target as a normal bullet but can be seen by the visible radiation which it emits. In the case of a tracer element or tracer

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The radioisotopes are being made available by the Manhattan Engineer District under a program announced June 14. This announcement followed many months of detailed study by the responsible heads of the Manhattan Project assisted by the scientists of Clinton Laboratories, the University of Chicago, the University of California and the University of Iowa.

It is contemplated that the radioisotopes, which are radioactive forms of common elements with the same chemical properties of the stable element but having a different atomic weight, will be prepared largely at the Clinton Laboratories operated for the Manhattan District by the Monsanto Chemical Company. The bombardment facilities of the Hanford Engineer Works at Pasco, Washington, now operated by the du Pont Company for the Government but which is to be taken over September 1 by General Electric Company, will also be used insofar as the flexibility of that operation allows. Additionally, the Argonne National Laboratory at Chicago, recently announced as the peacetime successor of the Metallurgical Laboratory, and still to be operated by the University of Chicago, cooperating with a group of midwestern universities, is aiding materially in pertinent preparations and research.

Each atomic element may occur in "sister" forms, called isotopes. An isotope differs from its sisters in the structure of the atomic "heart" or nucleus. The satellite electrons around the nucleus are arrayed the same for each element, hence the "sisters" meet the outside world and behave chemically alike. In addition to the stable sisters of elements which may occur in nature, it is possible by man-made devices, such as a pile or other atomic nucleus bombarding devices, to make isotopes which do not occur in nature and which are radioactive.

Radioactive sisters behave chemically the same as their normal stable sisters. Because of their radioactivity however, they can be followed in the processes in which they participate. Various terms have been used to indicate this property by which radioactive sisters can be followed, such as "tracer", "labeled", or "tagged" elements. By this it is meant they can be tagged much as wild fowl are banded to follow their migration. The tracer application is often also explained by an analogy with the use of tracer bullets. A tracer bullet follows the same path and arrives at the same target as a normal bullet but can be seen by the visible radiation which it emits. In the case of a tracer element or tracer isotope, it is "seen" by instruments, such as Geiger counters or electroscopes, which receive and register the radiations emitted by the radioactive atomic "hearts".

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Another imaginative analogy refers to the radioisotopes betraying the presence of their sister stable isotopes by "broadcasting" their position by means of radio activity. In still a further analogy the labeled isotopes are imagined as carrying small lanterns by which they signal their presence; the "light" (penetrating radiation) coming from the atomic lanterns being detected by very sensitive radiation instruments.

Very small organisms or very small virus particles can be followed by high-powered microscopes or by electron microscopes. The tracer element technique permits an even more minute and detailed investigation of chemical and biological processes. In this case, atoms and molecules themselves may be traced; and furthermore their identity and changes in identity may be followed. This amounts to an "atomic microscope."

It is obvious that the ability to follow the course of atoms and molecules will permit investigations that have heretofore defied attack by other methods. By this means the role of carbon, phosphorus, sodium, sulphur, and other widely occurring elements may be followed in important metabolic and organic processes in plants, animals and human beings. Moreover, almost any element can be traced through the complicated maze of reactions and processes which occur in chemistry, metallurgy and industrial processes in general.

In a few cases the tracer bullet isotopes are not only useful as tracer or "atomic spies" but as active "atomic Artillery"; in which case the radioactive isotope can be used to irradiate the locations where they deposit. Some influence has been thus achieved in controlling certain forms of leukemia, and polycythemia vera, both very special types of blood disorders. The use of radioactive materials in therapeutic connections is still very much in the investigational stage. Only a limited number of well qualified and experienced institutions undertake such investigations. In no instance has there been any claim for a cure for any blood disfunction by the use of radioisotopes. The greatest benefits from the use of these materials will most likely come, not from therapeutic uses, but by using the tracer technique in investigating the causes of disease and the life process in general.

END

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AUG 2 [illegible]

BACKGROUND MATERIAL

PRODUCTION OF RADIOACTIVE ISOTOPES IN THE PILE

A radioactive isotope, commonly referred to as a "radioisotope," in the uranium chain-reacting pile, is made by placing in the pile a stable element, which may be in the form of a metal or a salt or even a liquid or a gas, and simply leaving it there for a given length of time. This is the basic process and it applies regardless of whether the material inserted is a fissionable material, such as uranium, a common salt such as sodium chloride, or an ordinary metal such as iron. The method is known as the pile irradiation of the material.

As we examine the considerations which must be met, however, the irradiation process becomes more complicated. The material put into the pile must be protected from the temperatures which it will meet (hence liquids and gases are not usually used), and from the action of air and water vapor in the air, etc. It must be enclosed in a container not only for the above reasons but so that it may be easily handled. This requirement means that a standard size and shape of container is desirable. The form and purity of the material exposed, as well as the material of which the exposure can is made, must be such as to minimize neutron loss—that is, the drain on the power of the pile must be kept to a minimum. These conditions are usually met by carefully selecting the form of the element to be exposed and using aluminum for the can in which it is enclosed.

The second major consideration is the subsequent separation of the newly created radioactive species from its "parent," the latter being the element or compound put into the pile. Such separation may be exceedingly complicated, as in the case of the extraction of the individual fission products from the parent uranium; it may be relatively straightforward and simple, as in the extraction of radioactive iodine from the parent tellurium; or it may be skipped altogether, as in the case of radioactive phosphorus, produced by the exposure of phosphorus itself. In the last named case, the radioactive phosphorus cannot be separated from the stable phosphorus parent (here the stable phosphorus is called a "carrier" for the tiny amount of radio-phosphorus). Therefore, the material can be shipped and used as soon as it is taken out of the pile.

The Canning Operation:

Two types of aluminum cans are used to enclose material for isotope production in the pile. One is a welded tight-fitting aluminum jacket. This is used both for the uranium (which keeps the pile going and in which fission products are created) and for the calcium nitrate salt, which is, at present, being irradiated for the creation of the widely discussed carbon 14 isotope. The reason for the use of the uranium-type jacket for the nitrate salt is because it has been found advantageous to load this into the pile in the same manner as the uranium itself is loaded. The parent materials for all the other radioisotopes which are produced in the Clinton Laboratories pile—over 50 in number—are placed in a small aluminum can about the size and shape of a man's index finger. The amounts of material which are put into these small exposure cans vary from a few milligrams (a milligram is 1/500,000th of a pound) to an ounce or two. The amount used depends upon the relative affinity (known as "cross-section") of the exposed material for neutrons and upon the amount of the radioisotope one wishes to make.

Loading, Irradiation and Unloading:

These small cans are then set into holes in a graphite block, running into the center of the pile. When the graphite block containing a number of such cans is loaded, it is pushed into the pile and left there during the period of irradiation.

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While the pile is being loaded or unloaded it is not running—that is to say, the control rods which stop the chain reaction are in place. This is to prevent a dangerous beam of neutrons from emerging through the hole which is being loaded. Even with the pile shut down, personnel must stand clear of the hole in order to avoid the residual gamma rays emerging from it.

MORE

After the loading has been accomplished and the open hole has been blocked so that neutrons cannot escape, the pile is started up. Usually the material is left in the pile for a matter of one to several weeks. The time of exposure depends upon the "half-life" of the desired radioisotope (the shorter the half-life, the shorter the practical exposure time), as well as upon the amount desired and the cross-section of the exposed material.

When it is time to remove the batch of samples, the pile is shut down and left long enough to permit the gamma radiation, which will come from the open hole, to die off to a relatively low value. Then the hole is opened and the graphite block is pulled out into a lead "coffin." This precaution is necessary because of the radiations being emitted by the exposed material and by the exposure can itself. Technicians stand by with radiation-measuring instruments to insure that no person exposes himself to a hazardous amount of radiation. The samples are removed one by one from the block by means of long tongs, examined with the instruments and then placed in a lead "safe" for temporary storage. Even those samples which emit very little radiation are not picked up with the bare hand. Gloves are always used because of the danger of picking up small amounts of radioactive material from the surface of anything which has once been inside the pile.

Chemical Processing: Separation of Radioisotope from Parent and Impurities:

Many of the cans thus removed from the pile are ready for shipment as they stand, requiring only to be placed in a container with lead walls of sufficient thickness to stop harmful radiation. Radioisotopes thus shipped without subsequent chemical processing are referred to as "non-processed irradiations." By and large, those radioisotopes which do not involve a transmutation are included in this group (for example, P 32 produced from P 31, S 35 produced from S 34, etc.) A transmutation may be illustrated by the production of C 14, whose parent is N 14 and not carbon. In the latter case, the chemical difference permits the chemist to separate the new radioactive species, C 14, from the parent, stable nitrogen. In the case of the fission products, whose parent is uranium and of which there are many individual species (for example, barium, iodine, cerium, etc.), the chemical separation must not only remove the radioactive species from the parent uranium but also separate each radioactive element from all the others.

The chemical extraction of radioactive species in quantity requires a very special type of laboratory (a "hot" laboratory) and equipment and personnel experienced in dealing with potentially dangerous material. The radiations which are emitted by the material whose separation must be accomplished require shields of lead or concrete between the material and the chemist or else operating at a distance from the material (since distance can compensate for thickness of shield). Thus, the operator must devise remotely-controlled methods. On the other hand, the amounts of radioactive material with which he works, while emitting large quantities of radiation, are very small in mass or weight, in some cases being entirely invisible; hence, he is working with small equipment, small volumes of solutions, etc., just as he would in an ordinary laboratory. This requires him to be close to his material if he wishes to see what he is doing. These conflicting demands are usually met by the use of heavy shielding which permits closeness, and periscopes which allow the operator to see the material with which he is working around a corner. Since radiations travel in straight lines, there is no danger of the periscope itself permitting a dangerous leakage of radiation from behind the shield.

For many operations in which low levels or low intensities of radiation are encountered, the operator may use distance, perhaps one or two feet, as the shielding, working with tongs and such devices. For the separation of large quantities of fission products, however, a small room (about 4 x 6 x 8 feet, called a "cell") entirely enclosed by two feet of concrete is used. The apparatus for the extraction is placed inside this room with all controls on the outside where the operator and the eye-pieces of the periscopes are located. By means of air pressure, vacuum processes, electrical apparatus, rods and grappling devices, the operator is able to put the radioactive material through the required chemical and physical steps without entering the cell or removing the "hot" material from it.

Instrumentation:

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<u>Instrumentation</u>:

At all times, the chemists who perform such extractions in the "hot" laboratory depend upon a large variety of instruments for the detection and measurement of radiation from many sources in the building. There are instruments for measuring the general radiation level in the working area, for measuring the radioactivity

<u>MORE</u>

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carried on dust particles which may be inhaled, for measuring the extent of contamination on bench tops and other surfaces, for measuring the amount of either soft or penetrating radiation received by any portion of the operator's anatomy, for surveying shoes, clothes or hands for possible radioactive contamination, etc. The trained and careful operator knows which instruments are good for which purposes and depends upon them to the same extent that the aviator in a fog depends upon his instruments. The radiations from radioactive materials can be "seen" only with instruments.

Instruments are not only required for the protection of the individuals who work with radiation but are also necessary for the success of the chemical work. Instruments are built into certain parts of the apparatus in order that the operator may at all times know how much of a radioactive material is at a given point. Electronic radiation-measuring instruments are to the radio-chemist what the balance is to chemists in general and what the microscope is to the bacteriologist; without the proper instruments, he cannot measure or "see" the material with which he is working.

As mentioned above, the mass of a pure radioactive species is very small in relation to its activity. One curie of a radioisotope (roughly equivalent in radioactive disintegration rate to one gram of radium) may be contained in from one <u>gram</u> of material (for example, radium or C 14) to as little as one <u>microgram</u> of material (for example, radioactive iodine or phosphorus). (One microgram is one five-hundred-millionth part of a pound and is too small to be seen with the naked eye.)

The chemist who is separating fission products from uranium is thus confronted with the problem of separating several chemical species in amounts of about a microgram each from a kilogram (thousand grams) amount of uranium. In other words, each fission species is present in a chemical amount which is about one billionth the amount of uranium present.

<u>Shipping</u>:

The final product from a radio-chemical separation of this kind is usually an ounce or so of a water or acid solution containing a "weightless" amount of the radioactive species desired. Since one cannot weigh out fractions of the radioactive material, one depends upon taking fractions of the solution instead. For this reason, such separated "carrier-free" radioactive materials are shipped as solutions in small glass bottles. In order to guard against the dangers of accidental breakage in transit, the bottle is enclosed in a stainless-steel tightly-closed container which is then placed inside a lead case whose walls are sufficiently thick to permit handling en route to the recipient. Thus the shipping container for separated radioactive materials differs from that used for the non-processed materials mentioned above. The latter are solids inclosed in a closed aluminum can when they emerge from the pile and, hence, do not require extensive precautions against leakage of the material. Although most radioactive species emit radiations of such strength as to require lead containers for shipment or handling, others (e.g. C 14 and S 35) emit such weak radiation that the thin aluminum can or a glass bottle or a wooden box is all that is required to stop the radiation. All radioactive materials packed for shipment are measured with the appropriate instruments to be sure that the radiation from the sample is prevented from escaping to the outside and to guard against possible surface contamination of the shipping box with radioactive materials which could be rubbed off in transit.

<u>END</u>

August 2, 1946